

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.:

Group Art Unit:

Inventor: Lynch

Filed: Concurrently

Title: Method For Operating A Pulse Tube  
Cryocooler System With Mean  
Pressure Variations

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Sir:

In accordance with 37 CFR 1.51, 1.56 and 1.97 to 1.99, the following is a relevance statement on each citation listed on attached form PTO-1449, and is made of record to assist the Patent & Trademark Office in its examination of this application:

U.S. 6,374,617 – Bonaquist et al. discloses a pulse tube system wherein a product fluid is liquefied by refrigeration generated by a pulsing compression wave which rejects heat into a cryogen fluid heat sink. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in the event of a change in the mean pressure of the working gas the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.

U.S. 6,604,363 – Corey et al. discloses a method for matching an acoustic load and an acoustic driver in a resonant acoustic system, and the acoustic system so formed, comprising a matching volume positioned between the acoustic driver and load that is substantially greater than a stroke volume of the driver. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in

the event of a change in the mean pressure of the working gas the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.

U.S. 6,640,553 – Kotsubo et al. discloses a pulse tube refrigeration system having a pulse generator, a regenerator and a pulse tube, comprising a tapered work transfer tube interposed between the pulse generator and the regenerator. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in the event of a change in the mean pressure of the working gas the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.

U.S. 6,644,038 – Acharya et al. discloses a pulse tube refrigeration system wherein the pulse tube working gas is cooled to a defined first stage temperature and is brought to a defined second stage temperature by operation of a regenerator and pulse tube, which are in flow communication through a cold heat exchanger, prior to providing refrigeration to a high temperature superconductor. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in the event of a change in the mean pressure of the working gas the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.


Optimization Of The Orifice Pulse Tube – deBoer discusses optimization of an orifice pulse tube considering three optimization constraints which are given amplitude of the driving pressure, given driving power, and given amplitude of the piston. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in the event of a change in the mean pressure of the working gas

the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.

Performance Of The Inertance Pulse Tube – deBoer discusses the operation of an inertance pulse tube considering the parameters of the dimensions of the inertance tube, the volume of the pulse tube, the conductance of the regenerator, the driving pressure, and the frequency. There is no disclosure of a method for operating a pulse tube cryocooler system wherein in the event of a change in the mean pressure of the working gas the frequency of the pressure wave generator is changed directly with the change in the mean pressure, and thus this reference neither discloses nor suggests applicant's claimed invention.

A copy of each of the non-patent citations is enclosed herewith.

Respectfully submitted,

  
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| Form PTO-1449<br>(Rev. 8-83)  |  | U.S. Department of Commerce |  | Atty. Docket No.<br>D-21414   |  | Serial No. |  |
| <b>Information Disclosure Citation</b><br>(Use several sheets if necessary) |  |                             |  | Applicant<br>Nancy Jean Lynch |  |            |  |
|   |  |                             |  | Filing Date                   |  | Group      |  |

| U.S. PATENT DOCUMENTS |  |                 |   |   |   |   |   |   |         |                  |       |          |                               |
|-----------------------|--|-----------------|---|---|---|---|---|---|---------|------------------|-------|----------|-------------------------------|
| Examiner<br>Initial   |  | Document Number |   |   |   |   |   |   | Date    | Name             | Class | Subclass | Filing Date<br>if Appropriate |
|                       |  | 6               | 3 | 7 | 4 | 6 | 1 | 7 |         |                  |       |          |                               |
|                       |  | 6               | 3 | 7 | 4 | 6 | 1 | 7 | 4/2002  | Bonaquist et al. | 62    | 6        |                               |
|                       |  | 6               | 6 | 0 | 4 | 3 | 6 | 3 | 8/2003  | Corey et al.     | 62    | 6        |                               |
|                       |  | 6               | 6 | 4 | 0 | 5 | 5 | 3 | 11/2003 | Kotsubo et al.   | 62    | 6        |                               |
|                       |  | 6               | 6 | 4 | 4 | 0 | 3 | 8 | 11/2003 | Acharya et al.   | 62    | 6        |                               |
|                       |  |                 |   |   |   |   |   |   |         |                  |       |          |                               |
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| FOREIGN PATENT DOCUMENTS |  |                 |  |  |  |  |  |  |      |         |       |          |             |    |  |
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|                          |  | Document Number |  |  |  |  |  |  | Date | Country | Class | Subclass | Translation |    |  |
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|                          |  |                 |  |  |  |  |  |  |      |         |       |          |             |    |  |

| Other Documents (including Author, Title, Date, Pertinent Pages, Etc.) |  |  |   |
|--|--|--|---|
|  |  |  | de Boer, "Optimization of the Orifice Pulse Tube". Cryogenics 40 (2000) pp 701-711  |
|  |  |  | de Boer, "Performance of the Inertance Pulse Tube". Cryogenics 42 (2002) pp 209-221 |
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| Examiner | Date Considered |
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